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Application No.: 09/632,809   **Docket No.: 1509-277**

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of Claims:

1.   (*Currently amended*) ~~An image~~ A method of processing an original image, ~~method,~~ comprising:

warping an initial line pattern of the original image based [[upon]] on pixel brightness values of the original image ~~and a comparison of original image pixel values and warped line pixel values~~ to produce a warped line brightness pattern; and

producing an engraving-style halftone image by mapping the pixel brightness values of the [[an]] original image onto the warped line brightness pattern, the mapping including a comparison of the pixel brightness values of the original image with pixel brightness values of the warped line brightness pattern.

2.   (*Cancelled*)

3.   (*Currently amended*) The method of claim 1, wherein the initial line pattern is oriented substantially along an initial direction of the original image and the initial line pattern is warped in a direction substantially orthogonal to the initial direction to assist in producing the warped line brightness pattern.

4.   (*Currently amended*) The method of claim 1, wherein the initial line pattern is warped based on [[upon]] a brightness density map extracted from the pixel brightness values of the original image, the brightness density map being a representation of the brightness of pixels along a line of the initial line pattern of the original image.

5.   (*Currently amended*) The method of claim 4, further comprising producing [[a]] the brightness density map by sampling the pixel brightness values of the original image.

5

6.   (*Currently amended*) The method of claim 1, wherein the initial line pattern of the original image is warped based [[upon]] on brightness gradient information computed from the pixel brightness values of the original image.

7.   (*Currently amended*) The method of claim 6, further comprising computing brightness gradient information for a pixel location of the original image based on [[upon]] a weighted average averaging of brightness gradient information of the original image computed from neighboring pixel brightness values of the original image.

8.   (*Currently amended*) The method of claim 1, wherein the initial line pattern of the original image is based on [[upon]] a set of displacement values computed for pixel locations along each line of the initial line pattern of the original image.

9.   (*Currently amended*) The method of claim 1, wherein the initial line pattern of the original image is warped by inserting or removing one or more lines between adjacent lines of the initial line pattern of the original image.

10.   (*canceled*)

11.   (*Currently amended*) The method of claim 1, wherein the original image is mapped onto the warped line brightness pattern by producing black pixel values of the engraving-style image at pixel locations where the pixel brightness values of the original image pixel values are less than the corresponding pixel brightness values of the warped line brightness pattern pixel values, and producing white pixel values of the engraving-style image at pixel locations where the pixel brightness values of the original image pixel values are greater than or equal to the corresponding pixel brightness values of the warped line brightness pattern pixel values.

12.   (*Currently amended*) A system for An image processing an original image, system, comprising a processor programmed to warp an initial line pattern of the original image based on [[upon]] pixel brightness values of the original image and a comparison of original image pixel values and warped line pixel values to produce a warped line brightness pattern, and to map the an original image onto the warped line brightness pattern to produce an engraving-style halftone image,

6

the mapping including a comparison of the pixel brightness values of the original image with pixel brightness values of the warped line brightness pattern.

13.   (*Currently amended*) The system of claim **12**, wherein the initial line pattern of the original image is warped based on [[upon]] a brightness density map extracted from the pixel brightness values of the original image the brightness density map being a representation of the brightness of pixels along a line of the initial line pattern of the original image.

14.   (*Currently amended*) The system of claim [[12]] 13, wherein the processor is programmed to extract produce a the brightness density map extracted from the pixel brightness values of the original image.

15.   (*Currently amended*) The system of claim **12**, wherein the initial line pattern of the original image is warped based on [[upon]] brightness gradient information of the original image computed from the pixel brightness values of the original image.

16.   (*Currently amended*) The system of claim [[12]] 15, wherein the processor is programmed to compute brightness gradient information for a pixel location of the original image based on [[upon]] a weighted average averaging of brightness gradient information of the original image computed from neighboring pixel brightness values of the original image.

17.   (*Currently amended*) The system of claim **12**, wherein the initial line pattern is based on [[upon]] a set of brightness displacement values computed for pixel locations along each line of the initial line pattern of the original image.

18.   (*Cancelled*)

19.   (*Currently amended*)   The system of claim **12**, wherein the original image is mapped onto the warped line brightness pattern by producing black pixel values of the engraving-style image at pixel locations where the pixel brightness values of the original image pixel values are less than the corresponding pixel brightness values of the warped line brightness pattern pixel values, and producing white pixel values of the engraving-style image at pixel locations where the pixel brightness values of the original image pixel values are greater than or equal to the corresponding

7

pixel brightness values of the warped line brightness pattern ~~pixel values~~.

20. (*Currently amended*) A computer-readable medium carrying ~~instruct tions~~ instructions for causing a computer to execute the following operations:

warping an initial line pattern of an original image based on [[upon]] pixel brightness values of the original image ~~and a comparison of original image pixel values and warped line pixel values~~ to produce a warped line brightness pattern; and

mapping the [[an]] original image onto the warped line brightness [[lie]] pattern to produce an engraving-style halftone image, the mapping including a comparison of the pixel brightness values of the original image with pixel brightness values of the warped line brightness pattern.

21. (*New*) A method of processing an original image that is either a color or gray scale image and that can be anyone of (a) a continuous tone image, (b) a multi-tone image or (c) a halftone image, the method comprising:

responding to brightness values of pixels of the original image to produce a horizontally and vertically warped line pattern including a series of warped lines representing warped brightness values of the pixels of the original image, and

comparing the brightness values of pixels of the original image to the brightness values of spatially corresponding pixels of the horizontally and vertically warped line pattern to produce an engraving-style halftone image such that (a) pixels of the engraving-style halftone image that spatially correspond with pixels of the original image are black in response to the spatially corresponding pixels of the original image having a brightness value less than the brightness value of the spatially corresponding pixels of the horizontally and vertically warped line pattern and (b) pixels of the engraving-style halftone image that spatially correspond with pixels of the original image are white in response to the spatially corresponding pixels of the original image having a brightness value greater than or equal to the brightness value of the spatially corresponding pixels of the horizontally and vertically warped line pattern.

22. (*New*) The method of claim 21, wherein production of the horizontally and vertically warped line pattern includes: (a) obtaining brightness values of pixels along a series of

8

lines extending in a first of the horizontal or vertical directions of the original image; (b) deriving a gray level distribution curve in response to the brightness values of the pixels along each of the lines: (c) determining the spacing between adjacent halftone dots of each gray level distribution curve such that the areas of the gray level distribution curve between the adjacent dots are substantially the same, each line being formed by a search window including the pixels in the line and a predetermined number of pixels removed from the line in the second direction; and (d) for pixels on the line, summing the spacing of the halftone dots in the search window to obtain warping displacement values for pixels along the line so as to form a series of warped brightness pattern lines extending in the first direction.

23.   (New) The method of claim 22, further including forming the horizontally and vertically warped line pattern by interpolating in the second direction between the brightness values of the series of warped brightness pattern lines.

24.   (New) The method of claim 21, wherein production of the horizontally and vertically warped line pattern includes computing the magnitude and orientation of shading gradients at many pixel locations, A, of the original image in response to brightness values of the pixel at each location A of the original image and pixels in the vicinity of the pixel at each location A of the original image.

25.   (New) The method of claim 24, wherein the computing step weights the contributions of the pixels in the vicinity of the pixel at each location A in accordance with the distance between the pixel at each location A and the pixels in the vicinity of the pixel at each location A.

26.   (New) The method of claim 25, wherein the magnitude and orientation of the shading gradients are respectively computed in accordance with

$$V\_mag(x, y) = \Sigma^2_j \Sigma^2_j \, w\_mag(i, j) \cdot G\_mag(x\text{-}i, y\text{-}j)$$
$$V\_dir(x, y) = \Sigma^2_j \Sigma^2_j \, w\_dir(i, j) \cdot G\_dir(x\text{-}i, y\text{-}j)$$

where $w\_mag(i, j)$ and $w\_dir(i, j)$ are weighting coefficients for a pixel displaced from the pixel

9

at each location A by i pixels in the x-direction and j pixels in the y-direction.

$$G\_mag(x, y) = [(\delta A/\delta x)^2 + (\delta A/\delta y)^2]^{1/2}$$

$$G\_dir(x, y) = \tan^{-1}[(\delta A/\delta x)/(\delta A/\delta y)]$$

where

$\delta A/\delta x$ is the rate of change of brightness of the pixel at each location A in the x direction of the original image; and

$\delta A/\delta y$ is the rate of change of brightness of the pixel at each location A in the y direction of the original image.

27. *(New)* A processor arranged for performing the method of claim 21.

28. *(New)* A computer readable medium or computer storage device storing a program for causing a computer arrangement to perform the steps of claim 21.

29. *(New)* A system for processing an original image that is either a color or gray scale image and that can be anyone of (a) a continuous tone image, (b) a multi-tone image or (c) a halftone image, said system comprising a processor programmed to

respond to brightness values of pixels of the original image to produce a horizontally and vertically warped line pattern including a series of warped lines representing warped brightness values of the pixels of the original image, and

compare the brightness values of pixels of the original image to the brightness values of spatially corresponding pixels of the horizontally and vertically warped line pattern to produce an engraving-style halftone image such that (a) pixels of the engraving-style halftone image that spatially correspond with pixels of the original image are black in response to the spatially corresponding pixels of the original image having a brightness value less than the brightness value of the spatially corresponding pixels of the horizontally and vertically warped line pattern and (b) pixels of the engraving-style halftone image that spatially correspond with pixels of the original image are white in response to the spatially corresponding pixels of the original image having a brightness value greater than or equal to the brightness value of the spatially corresponding pixels of the

10

horizontally and vertically warped line pattern.

30.   (New) The system of claim 29, wherein production of the horizontally and vertically warped line pattern includes: (a) obtaining brightness values of pixels along a series of lines extending in a first of the horizontal or vertical directions of the original image; (b) deriving a gray level distribution curve in response to the brightness values of the pixels along each of the lines: (c) determining the spacing between adjacent halftone dots of each gray level distribution curve such that the areas of the gray level distribution curve between the adjacent dots are substantially the same, each line being formed by a search window including the pixels in the line and a predetermined number of pixels removed from the line in the second direction; and (d) for pixels on the line, summing the spacing of the halftone dots in the search window to obtain warping displacement values for pixels along the line so as to form a series of warped brightness pattern lines extending in the first direction.

31.   (New) The system of claim 30, wherein the processor is further programmed to form the horizontally and vertically warped line pattern by interpolating in the second direction between the brightness values of the series of warped brightness pattern lines.